

ABSTRACT

Improved microneedle arrays are provided having a sufficiently large separation distance between each of the individual microneedles to ensure penetration of the skin while having a sufficiently small separation distance to provide high transdermal transport rates. A very useful range of separation distances between microneedles is in the range of 100-300 microns, and more preferably in the range of 100-200 microns. The outer diameter and microneedle length is also very important, and in combination with the separation distance will be crucial as to whether or not the microneedles will actually penetrate the stratum corneum of skin. For circular microneedles, a useful outer diameter range is from 20-100 microns, and more preferably in the range of 20-50 microns. For circular microneedles that do not have sharp edges, a useful length for use with interstitial fluids is in the range of 50-200 microns, and more preferably in the range of 100-150 microns; for use with other biological fluids, a useful length is in the range of 200 microns – 3 mm, and more preferably in the range of 200-400 microns. For circular microneedles having sharp side edges, a useful length for use with interstitial fluids is in the range of 50-200 microns, and more preferably in the range of 80-150 microns; for use with other biological fluids, a useful length is again in the range of 200 microns – 3 mm, and more preferably in the range of 200-400 microns. For solid microneedles having a star-shaped profile with sharp edges for its star-shaped blades, a useful length for use with interstitial fluids is in the range of 50-200 microns, and more preferably in the range of 80-150 microns; for use with other biological fluids, a useful length is again in the range of 200 microns – 3 mm, and more preferably in the range of 200-400 microns, while the radius of each of its blades is in the range of 10-50 microns, and more preferably in the range of 10-15 microns.

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